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APPLICATION FOR LETTERS PATENT
UNITED STATES OF AMERICA

We, Heinz **FOCKE**, a citizen of Germany residing at Moorstrasse 64, 27283 Verden, Germany, and Hans-Jurgen **BRETTHAUER**, a citizen of Germany residing at Mockernstrasse 62, 28201 Bremen, Germany, have invented certain new and useful improvements in a

DEVICE FOR PRODUCING CIGARETTE PACKS

of which the following is a specification.

This application is the US Chapter II National Phase of Patent Cooperation Treaty International Application No. PCT/EP03/00047, having an International Filing Date of 7 January 2003, which designates the United States of America, and which in turn claims priority on German Patent Application No. 102 01 006.4, having a filing date of 11 January 2002.

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DEVICE FOR PRODUCING CIGARETTE PACKS

STATEMENT OF RELATED APPLICATIONS

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BACKGROUND OF THE INVENTION

1. Technical Field.

The invention relates to an apparatus for producing packs with a blank wrapping an article which is to be packaged, in particular a cuboidal cigarette pack with an outer wrapper made of film, it being possible for the blank of the outer wrapper to be folded around the article or around the cigarette pack and for peripheral folding tabs to be folded into a transversely directed position by a fixed-location, movable folding element.

2. Prior Art.

In the production of packs, it is usually the case that a flexible-tube fold of the blank is produced first of all. This means that the blank is positioned in U-shaped manner on the article, and folded around the latter, and the peripheral folding tabs projecting on one side are folded to form a partial overlap. In the case of cuboidal (cigarette) packs, inner blanks, paper blanks (for soft-carton packs) and outer wrapper made of film are folded in accordance with this principle.

The invention is concerned with folding blanks, in particular in conjunction with a flexible-tube fold being formed from the blank. The task, with a high packaging-machine performance and thus short operating cycles, is to provide as precise a fold as possible.

The object of the invention is thus to provide an apparatus for folding blanks by means of which, along with the high performance, the blank can be positioned against the article which is to be wrapped, and folded around the same, in a reliable and crease-free manner.

In order to achieve this object, according to the invention, the folding element can be moved relative to the article, or to the pack which is to be wrapped, while carrying along part of the blank in the direction of the free periphery or of the peripheral folding tab, with the blank being pressed against a surface of the article or of the pack.

According to the invention, rather than the blank being folded in an operating cycle, the folding element is moved continuously, in particular rolled, along the surface of the article, with the blank being pressed against the same and tensioned in the process, until the peripheral folding tab or flexible-tube tab is folded. Accordingly, the folding element is thus preferably designed as a folding roller which is rolled, by way of a matching circumferential surface, along the facing surface of the article with the blank, the region of the blank being pressed against the same and tensioned in the process.

Furthermore, according to the invention, the folding roller is designed with more or less radially directed folding crosspieces or folding noses which, at the end of the rolling movement, fold over a peripheral tab or flexible-tube tab against a transversely directed (side) surface of the article. The circumference of the folding roller - in a departure from a cylindrical shape - is designed such that it can roll from one periphery of the continuously moving article to the other periphery, with the flexible-tube tab finally being folded.

The further features of the invention concern the configuration of the folding element. An exemplary embodiment of the apparatus according to the invention is explained in more detail hereinbelow with reference to the drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a schematic side view of part of a packing machine.

FIG. 2 shows, on a vastly enlarged scale, a sub-region of a folding turret of the packing machine in the region of a folding station.

FIGs. 3 and 4 show, on a further-enlarged scale, a detail of FIG. 2 in different folding phases.

FIG. 5 shows a radially directed plan view of a folding element from FIG. 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The exemplary embodiment of the drawings is concerned with the production of cuboidal packs 10, namely cigarette packs of the soft-carton type.

This type of pack serves for accommodating a cigarette group which, in the case of the present exemplary embodiment, is enclosed by a single-piece blank. The pack 10 is completed by an outer wrapper made of film, namely by a blank 11 made of thin, transparent plastic film. The present exemplary embodiment is concerned with the folding and/or an important folding step for fitting the blank 11 of the outer wrapper.

The packing machine which is shown schematically in FIG. 1 comprises a pocket chain 12, for transporting cigarette groups which have been formed, a folding turret 13, a transfer turret 14 and a drying turret 15. The cigarette groups, as pack contents, are transferred to the folding turret 13 from the pocket chain 12. This folding turret produces the pack 10 and transfers it to a transfer turret 14, which passes the packs 10 on to the drying turret 15 in order to stabilize glued connections. The finished packs 10, finally, are transported away via a removal conveyor 16.

As is customary for a packer for soft packs, the folding turret 13 is provided with folding mandrels 17 along the circumference. These are thin-walled, elongate, rectangular hollow bodies. The pack contents, namely the cigarette group, are located within the folding mandrel 17. The blanks for forming the pack 10 are positioned one after the other on the outside of the folding mandrel 17 and folded thereon.

In the case of the exemplary embodiment shown, (paper) blanks for forming the pack 10 are positioned on the folding mandrel 17 in the region of a first blank station 18. In a following, first folding station 19 this (paper) blank is folded around the folding mandrel 17, this being accompanied by the formation of a base wall comprising folding tabs. This is followed by a second blank station 20, in the region of which the blanks 11 of film are fed to the folding turret 13 and/or the folding mandrels 17. The blank station 20 is designed such that the blanks 11 for the outer wrapper are each introduced into the movement paths of the continuously circulating folding mandrels 17, that is to say in a more or less radially directed movement. The blank 11, which is held available transversely to the movement direction of the folding mandrel, is carried along by the folding mandrel 17 as a result of the circulatory movement of the latter. The blank 11 here is positioned in a U-shaped manner around the folding mandrel 17 or around the (paper) blank already located on the folding mandrel 17.

The folding mandrels 17 are fitted on the folding turret 15 such that a first narrow side wall 21 is directed forward in the movement direction and a second side wall 22 is directed rearward in the movement direction. Furthermore, the folding mandrel 17 forms a large-surface-area outer wall 23, which is directed radially outward, and a radially inner wall 24.

The available blank 11 is carried along by the front side wall 21 of the folding mandrel 17. A radially outer folding leg 25 is positioned against the outer wall 23, and an inner folding leg 26 is positioned against the inner wall 24, of the folding mandrel 17. The dimensioning of the blank 11 results in projections, namely a radially outer inner tab 27 and a radially inner outer tab 28, being formed in the region of the rear side wall 22. The two folding tabs 27, 28 are folded one after the other against the side wall 22 to form the flexible-tube fold (FIG. 4), the entire inner tab 27 butting against the side wall 22, and the outer tab 28 partially overlapping the inner tab 27.

Once received by a folding mandrel 17, the blank 11 is fixed on the folding mandrel, to be precise by a pressure-exerting roller 29, in the region of the front

side wall 21. An inner tab 30 belonging to the base wall is already folded at the front in the region of the blank station 20.

The blank station 20 is formed in the top region of the folding turret, approximately in the region of an (imaginary) vertical center plane. Following the blank station 20, the folding mandrels 17 move in a downwardly directed movement path, in the form of an arc of a circle, into the region of a second folding station 31. This is where the inner tab 27 and outer tab 28 are formed into the flexible-tube fold. Between the blank station 20 and folding station 31, fixed and arcuate outer and inner guides 32, 33 are positioned on both sides of the folding mandrel 17 in order to keep the folding legs 25, 26 in the U-shaped folding position.

The folding station 31 has a folding element of particular design, namely a folding roller 34. The latter is positioned at a fixed location on the outer circumference of the folding turret 13, adjacent to the movement path of the folding mandrel 17. The folding roller 34 is driven in rotation such that the region which is directed toward the folding turret 13 in each case has the same direction of rotation as the folding turret 13 (arrows). The folding mandrels 17 are moved one after the other past the folding roller 34, a circumferential surface of the folding roller 34 butting against the outer wall 23 of the folding mandrel 17 and/or of the blank 11 during the movement phase. With continuous movement of the folding mandrel 17 and of the folding roller 34, the latter rolls on the outer wall 23. The folding roller 34 butts with linear or strip-like contact against the folding mandrel 17, to be precise beginning in the region of the front side wall 21 and continuing to the rear side wall 22. This continuous rolling movement has the effect not just of positioning the blank 11 or its folding leg 25 against the folding mandrel 17 or the already folded blank. Rather, it also causes the blank 11 to be smoothed in the direction of the free periphery, namely in the direction of the inner tab 27. The folding leg 25 is tensioned in abutment against the folding mandrel 17, with the formation of any creases being rolled out. At the end of the rolling movement, the inner tab 27 is folded into a transverse position with abutment against the side wall 22.

The folding roller 34 has a particularly configured contour or lateral surface. In the case of the present exemplary embodiment, four lateral portions 35 are formed one after the other along the circumference, each for executing a folding cycle, with the result that four successive packs 10 are processed in the above described manner during a full revolution of the folding roller 34. A radially projecting folding crosspiece 36, which extends in the axis-parallel direction, is formed between successive lateral portions 35. This folding crosspiece serves for folding over the inner tab 27 in each case at the end of a folding or rolling cycle.

The lateral portions 35 are designed to deviate (slightly) from a cylindrical surface, to be precise with account being taken of the kinematics during the rolling process on the facing surface of the pack 10 or of the folding mandrel 17. As can be seen from FIG. 2 in particular, the folding roller 34 or an approximately quarter-circle-shaped lateral portion 35 comes into abutment against the pack 10 or against the folding mandrel 17 by way of a region which is associated with the respective folding crosspiece 36. The rolling region of the lateral portion 35 is designed in the radial direction as a slight convexity 49, projecting slightly beyond the circular or cylindrical contour, whereas an upstream region of the lateral portion 35, as seen in the direction of rotation, is designed as a radial concavity 50.

The folding crosspieces 36 are also of particular configuration in cross section, that is to say they have a sharp-edged, rounded tapering in the direction of the radially outer end. A rounded chamfer 37 which adjoins the respective lateral portion 35 ensures a tensioning-maintaining folding movement of the inner tab 27 to follow the rolling operation of the lateral portion 35. The folding crosspiece 36 is radially dimensioned more or less to correspond to the width of the inner tab 27. In the end phase of the folding movement, the chamfer 37 is positioned in a form-fitting manner around a (rounded) edge of the folding mandrel 17 as the inner tab 27 is folded over.

In order to complete the flexible-tube fold, a further folding element becomes active in a temporarily coordinated manner. This folding element is a folding lever 38 with angled contour. Such a folding lever 38 is assigned to each

folding mandrel 17, namely is fitted on the folding turret 13. The folding lever 38 is designed such that a more or less radially directed movement takes place in the end phase of the folding operation (FIG. 2). In this case, an approximately circumferentially oriented supporting leg 39 comes into abutment against the radially inner side of the pack 10 or of the folding mandrel 17, namely against the folding leg 26 of the blank 11. A transversely or radially directed second supporting leg 40 grips the radially inner outer tab 28 and folds the latter, in time with the folding crosspiece 36, against the rear side wall 22 of the folding mandrel 17, the outer tab overlapping partially with the inner tab 27 (FIG. 4).

The folding tools, namely folding crosspieces 36, on the one hand, and folding lever 38 or supporting leg 40, on the other hand, are dimensioned, and coordinated with one another in respect of movement, such that overlapping does not take place even in the end phase. As can be seen from FIG. 4, the folding crosspiece 36 leaves the region on the rear side of the folding mandrel 17 while the supporting leg 40, on account of continued folding movement of the folding lever 38, completes the flexible-tube fold. The folding lever 38 or the supporting legs 39, 40 remains/remain in the folding position (FIG. 2) until the pack 10 is finished and leaves the folding turret 13.

The radially inner guide 33, in the form of a circle arc, interacts with the radially inner folding element - folding lever 38. The folding leg 26 of the blank 11 with outer tab 28 butts against this guide. The guide 33 thus terminates in the region of the folding station 31.

The guide 33, on the one hand, and the folding lever 38, on the other hand, are of comb-like design, and accordingly comprise a plurality of correspondingly shaped crosspieces (FIG. 5). These form, together, the guide 33 and/or the folding lever 38. The elements can be moved past one another on account of this comb-like design.

Interacting with the folding roller 34 is a co-running guide element by means of which the fold produced by the folding roller 34 is stabilized on the radially outer side. This guide element is an endless belt 41. The latter envelops

the folding roller 34 over a relatively large circumferential region determined by a fixed-location, rotating supporting roller 42. A supporting strand 43 of the endless belt 41, the supporting strand moving in the direction of rotation of the folding turret 13, butts against the outside of the pack 10 or of the folding mandrels 17 following the folding roller 34. The endless belt 41 thus extends over a sub-region of the movement path of the folding mandrel 17 up to a deflecting roller 44.

As can be seen from FIG. 5, the endless belt 41 comprises a plurality of, namely three, individual belts which are guided in grooves 45 on the circumference of the folding roller 34. The latter, in turn, rather than being configured as a continuously cylindrical structure, comprises a plurality of cylindrical roller portions 46, 47, 48 which are mounted at intervals from one another on a common shaft. The roller portions 46, 47, 48 are assigned to different regions of the folding mandrel 17 or of the blank 11. It is also the case that the distribution of the individual belts for forming the endless belt 41, in the case of different axial dimensioning of the roller portions 46, 47, 48, is divided up to take account of the folding function.

The above described folding means, in particular folding roller 34, can also be used, with a folding rolling movement for creating crease-free regions of blanks, in the production of other types of pack.

List of designations

10 Pack
11 Blank
12 Pocket chain
13 Folding turret
14 Transfer turret
15 Drying turret
16 Removal conveyor
17 Folding mandrel
18 Blank station
19 Folding station
20 Blank station
21 Side wall
22 Side wall
23 Outer wall
24 Inner wall
25 Folding leg
26 Folding leg
27 Inner tab
28 Outer tab
29 Pressure-exerting roller
30 Inner tab
31 Folding station
32 Guide
33 Guide
34 Folding roller
35 Lateral portion
36 Folding crosspiece
37 Chamfer
38 Folding lever
39 Supporting leg
40 Supporting leg
41 Endless belt
42 Supporting roller
43 Supporting strand
44 Deflecting roller
45 Groove
46 Roller portion
47 Roller portion
48 Roller portion
49 Convexity
50 Concavity